shown by the central pointer, from which pictures of the beats were taken off on the smoked glass, forming admirable slides.

Mr. R. Knight, of Wellington, who superintended the making of the apparatus, devised a neat arrangement for showing the lengths of resonant tubes (See Tyndall, Lecture V.). It consists of a 4-ft. length of 3-inch zinc tube mounted upright on a foot and nearly filled with water, so as to form a cistern in which a 2-in. tube is raised and lowered, answering at the proper height with powerful resonance to a large tuning-fork. This apparatus will, I expect, come into use in future as the most convenient means of demonstrating the principle of lengths of organ-pipes. When the instrument is used for class purposes, it may be recommended that the tube be graduated to quarters of an inch, so that the pupils may be practised in calculating the wave-length, and thence the pitch, of any tuning-fork tested by the resonant tube. Further, with reference to the theory of musical pipes, it may be worth while to mention that an 8-ft. length of $\frac{3}{4}$ in. iron gas tube serves well to produce the overtones of open pipes. It is best to fit some kind of trumpet mouth-piece at one end, by means of which the most elementary musical scale, that of simple trumpet-music, may be effectively given.

No ready way being found of displaying Sir. C. Wheatstone's kaleidophone experiments on a large scale, they were shown afterwards as table experiments. Since then, however, a Chinese joss-stick has supplied the means of showing to an audience the path of the end of a vibrating rod. A piece of the lighted stick attached to the end of an umbrella rib shows beautifully convoluted figures several inches across. Any other means of attaching a bright permanent spark may of course be used, and the plan serves also to show the path of a point on a long vibrating wire. The experiment of waving a large tuning-fork to and fro while in vibration, which Mr. Sedley Taylor described in NATURE, vol. v. p. 321, had also been noticed by us. For want of means of making the result visible at a distance, it was not shown in the lecture. An inch of lighted joss-stick, however, fixed transversely near the end of one leg, shows well the contrast between the line of light traced by waving the fork in its quiescent state, and the series of dots of light into which this line is resolved when the fork is waved or swung while in vibration, its counteracting movements bringing it to momentary rest.

E. B. TYLOR

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*ON THE SULPHUROUS IMPURITY IN COAL GAS**

THE lecturer commenced by stating the origin of the sulphurous impurity in coal gas to be the iron pyrites which is contained in coal, and that in the manufacture of gas, when the coal is strongly heated, the sulphur of the iron pyrites not only combines with hydrogen to form the gaseous sulphuretted hydrogen, but also with carbon, to form the very volatile liquid bisulphide of carbon. Little need be said of the desirability of removing the sulphur from coal gas, for in many of our large libraries, such as that of the Athenæum Club, the injurious effect of the sulphurous and sulphuric acids produced by the combustion of gas containing sulphur, seems to be plainly manifest, more especially on the leather binding of the books. The gas, after leaving the retorts in which the coal is heated, is cooled down, and passed through towers filled with coke, over which water is kept trickling. By these means a considerable proportion of the sulphur is removed in the form of sulphide of ammonium. It was shown by experiment that this washing with water could only be employed to a limited extent; as by excessive "scrubbing," as it is technically termed, the gas is greatly deteriorated as to its illuminating power. The sulphuretted hydrogen remaining in the crude gas is easily removed; but the removal of the bisulphide of carbon is attended with so many difficulties that up to the present time no satisfactory process has been devised to effect this purpose. The lecturer exhibited strikingly the two methods used for the removal of the sulphuretted hydrogen, one by passing the gas over lime, and the second by passing the gas over oxide of iron, and stated that it is comparatively rare to find any of this impurity in the gas as supplied to consumers. Up to the present time no process is used for the removal of the bisulphide of carbon. Mr. Harcourt has, however, found that by heating a mixture of bisulphide of carbon vapour and hydrogen to redness, the former is decomposed into sulphuretted hydrogen. It will be thus seen that the removal of the bisulphide of carbon from coal gas is rendered possible, for by simply heating the gas to redness the sulphur combines as before with hydrogen to form sulphuretted hydrogen, which can be easily removed by passing through a purifier containing oxide of iron. In this way, by passing coal gas, which contained 30 grains of sulphur in 100 cubic feet, through a red hot tube, and then through an iron purifier, the sulphur was reduced to about 5 or 6 grains in 100 cubic feet. It might be imagined that the passage of coal gas through a red hot tube would deteriorate its quality; but Mr. Harcourt's experiments show that the contrary is the case, for by passing gas of 14·91 candles rapidly through a tube heated to moderate redness, the illuminating power was found to be 15·1 candles, and after passing through a tube heated to bright redness, its illuminating power was increased to 16·66 candles. A parallel case to this is seen when marsh gas is decomposed into hydrogen and carbon by a series of electric sparks, the gas which is obtained occupies almost twice the original volume of the gas, but possesses a far greater illuminating power than that of the original marsh gas, owing to the presence of a small quantity of acetylene or some such body. It will be seen that these experiments offer what certainly seems to be a feasible process for the great reduction of the amount of sulphur contained in coal gas.

PROPOSED OBSERVATORY IN NEW ZEALAND

ON Dec. 16, 1850, the first ship-load of emigrants, under the auspices of the Canterbury Association, landed at Port Lyttelton and commenced the foundation of the present province of Canterbury. On Dec. 16, 1871, the settlement attained its twenty-first year, and it was felt by a large number of gentlemen here that it would be well to celebrate the majority of the province by some permanent memorial. A meeting was held on that day, attended by a number of the most influential residents; and it was unanimously resolved to form an association for the establishment of an astronomical observatory near Christchurch. It was remarked by several speakers that this province possesses considerable advantages for such an institution. Between the ocean on the east and the great range of the Southern Alps on the west, there stretches an expanse of unbroken plain more than 100 miles in length and 50 in breadth. The remarkable clearness of the atmosphere, joined to this large extent of level land, renders it possible to observe a much larger area of the heavens than is usually the case. The meeting fully endorsed the remarks of the promoters of

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* Abstract of a Lecture delivered at the Royal Institution on February 19, by A. Vernon Harcourt, F.R.S.

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the movement; a temporary committee was formed, and lists of subscribers and donors were at once commenced.

By a curious coincidence, the telegram announcing the formation of the Society no sooner came under the notice of the Colonial Government, than they informed the committee that they had, a short time before, received a communication from the Imperial authorities on the subject. The Astronomer Royal had intimated his desire to form a station in New Zealand for the observation of the Transit of Venus in 1874, and had recommended Canterbury as suitable for the purpose. This announcement was naturally most encouraging to the committee; steps were immediately taken by them to communicate, through His Excellency the Governor, with the Imperial Government. The Governor and his advisers have informed the Society that they cordially approve of its object, and will assist it as far as possible.

The Provincial Council of Canterbury was in session a few days later. Petitions were presented to it by the Society, praying for a grant of 1,000*l.* towards buildings, &c., and 5,000 acres of the waste lands of the province as an endowment towards the permanent maintenance of the Observatory. The Council, by a majority of twenty-five to eleven, voted the sum of 1,000*l.*, and 200*l.* for a site; but they declined at present to grant the endowment in land. The money grant of 1,200*l.* was likewise made conditional on the agreement of the Colonial Government to undertake the maintenance of the Institution. The great interest taken in the movement by His Excellency the Governor and his Ministers leads the Society to hope that a satisfactory arrangement may be made, so that before this time next year we may be placed in a position actually to commence operations.

Although only a month has elapsed since the first meeting, the Society has been warmly supported in this province. Additional subscriptions are received every day, and since January 22, when the temporary committee presented their report, the number of annual members has been increased to nearly 200.

I enclose the report of the temporary committee, which details the work actually done by them so far. You will see that the committee have attempted to commence the practical work of founding the Society by asking the Astronomer Royal to send out a gentleman to advise as to a proper site and other initiatory work. It is our hope that our object may receive a cordial concurrence from scientific men at home. We desire to co-operate with similar institutions in the old world by performing work which may not only be of practical use to our community here, but may, if possible, add something, however small, to the results of labours of older workers in the field of science. We trust that even one of England's youngest daughters may be of some assistance in this respect to her more favoured sisters.

W. M. MASKELL, Hon. Sec.
Observatory Society of Canterbury.

A NEW MODE OF TAKING CASTS

MR. BOYD DAWKINS, F.R.S., has recently exhibited to the Manchester Philosophical Society a number of casts in plaster of Paris of various objects of natural history, and explained the process by which any one can make them for himself. The material of the mould is artists' modelling wax, which is a composition akin to that which is used by dentists. And as it becomes soft and plastic by the application of heat, though in a cold state it is perfectly rigid, it may be applied to the most delicate object without injury. As it takes the most minute markings and striations of the original to which it is applied, the microscopic structure of the surface of the original is faithfully reproduced in the cast. The method is briefly this:—1. Cover the object to be cast with a thin powder of steatite or French chalk, which prevents the adhesion of the wax. 2. After the wax has become soft either from immersion in warm water or from exposure to the direct heat of the fire, apply it to the original, being careful to press it into the little cavities. Then carefully cut off the edges of the wax all round, if the under cutting of the object necessitates the mould being in two or more pieces, and let the wax cool with the object in it, until it be sufficiently hard to bear the repetition of the operation on the uncovered portion of the object. The steatite prevents the one piece of the mould sticking to the other. The original ought to be taken out of the mould before the latter becomes perfectly cold and rigid, as in that case it is very difficult to extract. 3. Then pour in plaster of Paris, after having wetted the moulds to prevent bubbles of air lurking in the small interstices, and if the mould be in two pieces, it is generally convenient to fill them with plaster separately before putting them together. 4. Then dry the plaster casts either wholly or partially. 5. Paint the casts in water colours, which must be *fainter* than those of the original, because the next process adds to their intensity. The delicate shades of colour in the original will be marked in the cast by the different quantity of the same colour which is taken up by the different textures of the cast. 6. After drying the cast, steep it in hard paraffin. The ordinary paraffin candles, which can be obtained from any grocer, will serve the purpose. 7. Cool, and polish the cast by hand with steatite. The result of this process is far better than that obtained by any other. The whole operation is very simple, and promises to afford a means of comparison of natural history specimens in different countries, which has long been felt to be a scientific need. It has been already introduced into America and India by Mr. Dawkins, and samples of the casts are to be seen in the British Museum, as well as in that of the Geological Survey, and of Oxford, and of the Queen's College. Casts of type specimens may be multiplied to any extent at a small cost of time and money, and are as good as the original for purposes of comparison, and almost as hard as any fossil.

The modelling wax can be purchased from Messrs. Lechertier, Barbe, & Co., artists'-colourmen, Regent Street.

THE NEBULA ROUND η ARGUS

A PAPER, accompanied by five drawings, has recently been read to the Royal Society of Victoria by Mr. McGeorge, on the star η Argûs and the great nebula near it, from which we select a few statements which appear to establish the occurrence of sensible changes in that region of the sky. After noticing the value of Sir John Herschel's drawing and description of the nebula, Mr. McGeorge remarks that from 1838 to 1869 no trustworthy observations of the nebula could be made, for want of instruments of sufficient power; though Mr. Tebbutt and others have contributed valuable information about η itself. A single glance is sufficient to show the complete inapplicability of Herschel's drawing or description to the present appearance of the nebula in the Great Melbourne Telescope. This, however, might be attributed to the great power of the instrument, whose light exceeds that of the 20-ft. reflector as much as that surpassed the other telescopes with which the nebula has been observed.

But the changes indicated in the present paper cannot be so explained, for they have nearly all been traced in the *Great Melbourne Telescope itself*, and are described in detail, with reference to drawings and observing notes. A few may be mentioned here.

η, which Herschel saw involved in dense nebula, was in April 1869 seen on the bare sky, the nebula having disappeared for some distance around it. Drawing No. 1, which accompanied the paper and which is here reproduced,

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